5th AIST Workshop on LCA for Asia Pacific Region

LCA of Global Supply Chains – From Production Through to End of Life Management

LCA for the food chain in the region (Session 1)
LCA for the waste chain in the region (Session 2)

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This workshop is the fifth in a series of workshops on LCA toward sustainability in the Asia Pacific region organized every two years by AIST, which was held on 14 and 15 November, 2006 at Tsukuba, Japan in cooperation with the 7th International Conference on EcoBalance (7ICEB), UNEP/SETAC Life Cycle Initiative and the Global Alliance for Lifecycle Assessment Centers (GALAC). The themes of the previous workshops were: the Role of LCA (1998); Inventory Database (2000); Development of the Methods for the Life Cycle Impact Assessment (2002); and Capacity Building (2004).

In this fifth workshop, LCA of global supply chains – from production through to the end of life management of the global supply chain – was discussed. The international supply chain of agricultural and food products and the international material flows of the electronic and electricity appliances after use were selected for workshop agenda, as they are typical themes of the global chain. The plenary discussion focused on LCA data collection in each country and possible international collaboration in sharing the data in the APEC region.

There were 66 participants from 19 different countries, 6 presentations on food supply chain and 5 presentations on the electronic appliances supply chain used. At the end of each session, we had a plenary discussion phase to raise some keywords that may indicate the future research themes and discuss the possibilities on international collaboration towards sustainability.

At the Opening Session on the first day, Dr. Atsushi Inaba, Director of the Research Center for Life Cycle Assessment, AIST gave an opening address on **Japan's LCA status** and movements, and explained the scope of the workshop.

Then, Dr. Masayuki Sagisaka, Vice Director of the Research Center for Life Cycle Assessment, AIST, presented a summary of the country reports in the region on the current situation in **LCA implementation**. This presentation was based on the survey results from the participants of each country, and showed clear evidence of significant progress in capacity building on LCA in some national governments, such as Malaysia, Australia and Brazil, that started funding the projects on LCI database development. In those countries, the development of life cycle impact assessment methodologies was also drawn into attention. By hearing this, Dr. Guido Sonnemann of UNEP proposed that UNEP would conduct a worldwide survey of this kind through the Cleaner Production Centers located in different regions. It appears that this survey should be adopted by UNEP as a useful indicator for national capacity building on LCA in the future.

Following the Opening Session, several presentations on **LCA for the food chain in the region** were given in **Session 1**.

1. Dr. Toshisuke Ozawa of the Research Center for Life Cycle Assessment, AIST, reported on lifecycle inventory analysis on meals: Efforts of the Food Study Group of the Institute of Life Cycle Assessment, Japan. According to Dr. Ozawa, the Food Study Group strives to calculate the CO_2 emissions from ingredients of the model meals as well as the direct energy consumption through cooking in Japan's households. He also mentioned that acquisition of inventory data from overseas is a prerequisite while performing LCA because Japan relies heavily on imported food products. The Food Study Group is currently discussing the definition of eco-efficiency on food and evaluation criteria of food values in order to develop sustainability indicators for food consumption and production. It was made clear that there are gaps between developed and developing countries on how to conceptualize the value of food products and how to image sustainability.

2. Dr. Takeo Shiina of National Food Research Institute reported on probable CO_2 emission abatement in Japan from global supply chain of fresh tomato based on empirical analysis. In tomato production, there was a significant increase in CO_2 emission from green house grown tomatoes in winter in comparison with tarped ones in summer due to its fuel consumption for heating. In the viewpoint of CO_2 emission reduction, importing tomatoes from South East Asia is preferable in Japan to growing them in a green house even if the fuel consumption for transportation is taken account.

3. Interesting regional reports were given: LCA on palm oil production by Ms. Hasnah Mohd Zin of SIRIM, Malaysia; and LCA on shrimp production by Dr. Rattanawan Tam Mungkung of Kasetsart, Thailand. Thailand is making attempts to reduce environmental burden in shrimp production by technology innovation. Needless to say that a major portion of the shrimp is exported to Japan. Analysis on international food supply chain is needed not only for agricultural products, such as palm oil and tomatoes, but also for fishery products. Furthermore, two reports were given by Dr. Armando Caldeira Pires of University of Brazil and Dr. Anthony SF Chiu of De la Salle University, the Philippines, on alcohol fuel production from sugarcane. The **production of bio-fuels** is promoted in various countries as it is consid-

ered carbon-neutral. The issue will be high in the agenda on sustainable land use in the future because severe competition is foreseen between food production and fuel production for the same commodity.

After these presentations, Dr. Atsushi Inaba of AIST chaired a **plenary discussion**. First, all the participants mined keywords to promote LCA on food systems for sustainability. All the keywords were sorted by categories in viewpoints, indicators, political instruments and technologies toward sustainability, as follows:

1) Viewpoints
- Local vs. global
- Sector and life cycle stage
- Consumption preference (meat or vegetable)
- Value of food
- Land use pattern for forestry, agriculture, urbanization, housing, under the condition of population increase

2) Indicators
- Energy, CO_2
- Biodiversity and cultural diversity
- Water consumption (water scarcity)
- Productivity (agriculture, fish stock)
- Nitrogen and phosphorous imbalance

3) Political instruments and technologies towards sustainability
- Eco-labeling and certification scheme of food
- Good food production practices
- International trade of food towards sustainability (e.g., CO_2)
- Comparison of LCA results of the same product in each country for trade barrier
- Storage utilization, post harvest technology (food waste), demand management
- Energy or food (e.g., EtOH from sugarcane)

All the participants agreed that researchers in food sector should keep focusing on the above items while conducting future research in order to keep pace with global or regional trends and needs.

Session 2 – LCA for the waste chain in the region – was held on Day 2.

Dr. Guido Sonnemann of UNEP DTIE reported on global views on **integrated resource and waste management**. He pointed out that the promotion of safe practices in waste treatment and management are still necessary in developing countries, despite the existence of the global supply chain of electronic devices used.

Dr. Atsushi Terazono of the National Institute for Environmental Studies gave a report of the working group on **waste recycling in Japan**. His report was based on the survey results of the current status of used electronic appliances exported to China and other countries from Japan, and of wastes being discarded without being treated. Creation of international markets for used electronic appliances may directly cause the creation of transboundary movements of wastes, which is banned by the Basel Convention.

Interesting **regional reports** were given from the following countries:

1. Dr. Sangeeta Thakore of the Indian Institute of Technology, Bombay reported on the current status of municipal waste treatment in India.
2. Dr. Khoo Hsien Hui of the Institute of Chemical and Engineering Sciences, Singapore, reported on treatment of food wastes. The treatment of foreign country-originating wastes is becoming a significant issue for local governments of the ultimate users of the imported goods. Again, the importance of UNEP's e-waste initiative was recognized and emphasized.
3. At last, Dr. Gong Xianzheng of Beijing University of Technology gave a report on accumulation of the LCI database, including the waste treatment stage and the LCA software that is equipped with the inventory data.

The **plenary discussion** was chaired by Dr. Vinod K Sharma of Indira Gandhi Institute of Development Research and Dr. Atsushi Inaba of AIST. The chairpersons proposed that the discussion be separated into the issues on brand new products and used products. International traffic of used products can be rather observed as transboundary movements of wastes, as opposed to markets for new products. There were some opinions that the issue of waste treatment system is for the importing countries of used electronic appliances through a legitimate bargain, and illegal trading is a separated issue. Although international supply chain of used appliances can be looked from a moral standpoint as an imposition of wastes to developing countries, the best possible solution seems to be the promotion of sound treatment systems for wastes in the location within the importing countries. The following points were outlined for issues on **waste treatment at local level**.

1) Transboundary movement of wastes is illegal, that is why we do not call it waste but 'second hand products'

- Regarding the second-hands products including E-waste, economic aspects (cost and efficiency) and social issues (consumer behavior, population density and economics) must be evaluated.
- LCA case studies of environmental aspects on international trade of second-hand products are necessary including a viewpoint of heavy metals contents in soil.

2) Waste management in each country must be established from the following viewpoints:

- Technology: Infrastructure depends on treating wastes (waste characterization)
- Social issues: consumer behavior, population density and economics
- Regulations: Reduce, Reuse and Recycle

It is essential that the LCA data of the products, from cradle to grave, should be shared among the Region in order to reduce the environmental impacts because the international trade of the products has been on the rise every year due to economic growth of countries in the Region.
From the viewpoint of the reduction of global environmental impacts, the output of this workshop must be utilized, not only for the LCA research but also for the practical activities towards sustainability in the Region.